AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A device for detecting target molecules comprising:

a substrate

a film bulk acoustic piezoelectric resonator (FBAR) having edges, comprising piezoelectric material sandwiched between and coupled to[[:]] a pair of electrodes; wherein the at least one of electrodes ~~have~~has at least one functionalized surface ~~which~~ that ~~is opposite to the resonator, wherein the functionalized surface~~ is configured to react with target molecules, ~~which~~ wherein the FBAR is ~~attached to~~positioned with the edges on the substrate ~~at its edges~~; and

a control circuitry comprising a signal generator configured to apply an excitation signal that includes a plurality of frequencies to the pair of electrodes and a processing circuitry to determine ~~the~~ an impedance of the ~~resonator~~ FBAR as a function of frequency, such that ~~the~~ a mass, or ~~the~~ an electrostatic charge or both, of the target molecules that have reacted with the functionalized surface causes a detectable change in ~~the~~ a frequency response of the FBAR.

2.-3. (Previously Canceled).

4. (Previously Presented) The device of claim 1, wherein the piezoelectric material is AlN or ZnO.

5. (Previously Presented) The device of claim 1, wherein the excitation signal comprises an in-phase signal.

6. (Previously Presented) The device of claim 1, wherein the excitation signal comprises an out-of-phase signal.

7. (Previously Presented) The device of claim 1, wherein the excitation signal comprises a time variant, single frequency signal.

8. (Previously Presented) The device of claim 1, wherein the excitation signal comprises a mixed frequency signal.

9. (Previously Presented) The device of claim 1, wherein the excitation signal comprises a time-variant, mixed frequency signal.

10. (Original) The device of claim 1, wherein the functionalized surface comprises one or more biomolecules configured to bind with the target molecules.

11. (Original) The device of claim 10, wherein the biomolecules comprise biologically active molecules.

12. (Original) The device of claim 10, wherein the biomolecules comprise biologically derivatized molecules.

13. (Original) The device of claim 1, wherein the functionalized surface is functionalized by immobilization of biomolecules on a self-assembly monolayer.

14. (Original) The device of claim 1, wherein the functionalized surface is functionalized by immobilization of biomolecules on an organic membrane.

15. (Original) The device of claim 14, wherein the organic membrane is pre-coated onto the functionalized surface.

16. (Original) The device of claim 14, wherein the organic membrane is chemically derivatized on the functionalized surface.

17. (Original) The device of claim 16, wherein the organic membrane is chemically derivatized on the functionalized surface by silylation.

18. (Original) The device of claim 16, wherein the organic membrane is chemically derivatized on the functionalized surface by acylation.

19. (Original) The device of claim 16, wherein the organic membrane is chemically derivatized on the functionalized surface by esterification.

20. (Original) The device of claim 16, wherein the organic membrane is chemically derivatized on the functionalized surface by alkylation.

21. (Original) The device of claim 1, wherein the functionalized surface is functionalized by direct immobilization of biomolecules on metal.

22. (Original) The device of claim 1, wherein the functionalized surface is functionalized by direct immobilization of biomolecules on a non-metallic inorganic film.

23. (Original) The device of claim 1, wherein the functionalized surface is functionalized by self-assembling biomolecular layers on the functionalized surface.

24. (Original) The device of claim 23, wherein the assembling biomolecular layers comprise amino acid derivatized fatty acids or lipids.

25-30. (Canceled)

31. (Previously Presented) The device of claim 1, which further comprises a second piezoelectric resonator and an additional pair of electrodes having a non-functionalized surface coupled to the second piezoelectric resonator, wherein the control circuitry is configured to apply the excitation signal to the additional pair of electrodes and to determine a frequency response for the second piezoelectric resonator.